ABSTRACT

CARBITS is a market simulation model for the passenger vehicle market in California. Professor David S. Bunch developed CARBITS for the ARB during 2003-2004 under a contract with the University of California, Davis. Its primary purpose is as a scenario analysis tool to evaluate market response under alternative regulation scenarios. For purposes of this Final Report, the version of CARBITS developed during 2003-2004 will be referred to as "CARBITS 1.0." CARBITS 1.0 was requested by the ARB to meet specific needs for their work under AB 1493 regulating motor vehicle greenhouse gas emissions, and was developed within a short time frame to accommodate their schedule. The project was feasible because it was possible to base CARBITS development on pre-existing research results developed under an earlier University of California-Institute of Transportation Studies research program. Although time and monetary constraints prevented development of a full range of features, ARB staff successfully used CARBITS 1.0 in support of the climate change regulation adopted by the Board in September 2004.

This project has produced an updated version of CARBITS ("CARBITS 2.0") with a number of improvements and new features to address specific perceived "deficiencies" identified by ARB staff during the collaboration with Prof. Bunch. Some of these represented desired extensions based on experience in using the model. A related area of concern is the ever-present potential for criticism by the hired consultants of various stakeholders. The original project proposal identifies a list of specific goals:

1. Estimate a new set of vehicle choice models using more recent datasets.
2. Specifically address the issue of vehicle market exit/scrappage.
3. Develop re-calibration procedures to update certain model constants based on aggregate-level vehicle counts.
4. Include the capability to address hybrid electric vehicles.
5. Address issues of statistical noise and runtimes.

These specific goals have been addressed by this project. A new set of vehicle choice models has been estimated using data from the 2000-2001 Caltrans Statewide Travel Survey. This data source (although a few years old) is attractive due to its large sample size and high-quality sampling and weighting characteristics. In conjunction with using these data (which include information on vehicle holdings, but not transactions), CARBITS was converted from a transactions microsimulation model to a vehicle holdings model. This approach directly addresses the issue of statistical noise and run times: holdings models use analytical computations that yield deterministic (noise free) results requiring relatively short run times. Substantial effort was invested in data compilation and cleaning for this project. In particular, procedures for using DMV data routinely accessible to ARB were developed to address needs for periodic re-calibration using updated vehicle counts, patterns of vehicle market exit, and recent penetration of hybrid electric vehicles. Aside from meeting specific project goals, the substantial amount of work on data development, and the formulation of a generic vehicle market model framework, will provide additional benefits to ARB in succeeding projects.